Research

Age, Working Memory, Figurative Language Type, and Reading Ability: Influencing Factors in African American Adults' Comprehension of Figurative Language

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This study investigated the cognitive and linguistic factors presumed to be associated with adult comprehension of figurative language, including age, working memory (WM), figurative language type, and reading comprehension (RC). Forty younger (M = 22 years) and 40 older (M = 63 years) healthy African American adults completed WM and reading tasks, and the 60-item forced-choice multiple-category (20 idioms, 20 metaphors, and 20 metonyms) Figurative Language Comprehension Test. After controlling for WM and RC, the older adults outperformed the younger adults on idioms and metonyms. Metaphor comprehension was comparable between the groups. Findings demonstrate that WM and RC underlie adults' comprehension of figurative language and should be considered when interpreting performance on tests assessing figurative language competence in this population.

Key Words: figurative language, language comprehension, African American adults, working memory, metaphor in aging

Working memory (WM) is the aspect of memory that involves the simultaneous storage and processing of information. Theoretically, WM is composed of three subcomponents—an executive attentional controller, a memory buffer for processing phonological information, and a memory buffer for processing visuospatial information (Baddeley, 2000; Shimamura, 1994). The resource hypothesis view proposes that WM comprises a limited number of general-purpose entities (resources) that can enable or enhance a range of cognitive functions (Salthouse, 1990), including reasoning, learning, mental calculation, and language comprehension (Baddeley, 1986; Baddeley & Hitch, 1974).

Generally, older adults show markedly greater difficulty on tasks assessing WM than their younger counterparts (Craik, 1986; Foos, 1989; Harris, Rogers, & Qualls, 1998; Salthouse, 1994), although the loci (storage versus processing component) of the deficiency (Foos, 1995; Foos & Wright, 1992; Zacks & Hasher, 1988) continues to be debated. Capacity theorists argue that age-related decline in WM results from a reduction in the amount of resources available for either storing or processing information, or both (Craik, 1986; Foos & Wright, 1992). Allocation theorists, on the other hand, contend that age-related deficits in WM occur because of inefficient allocation of available resources (e.g., Foos, 1995; Just & Carpenter, 1992). Resources are allocated to either storage or processing functions based on the level of activation, which will depend on the task requirements (Just & Carpenter, 1992).

Decline in WM has been implicated as a possible explanation for age-related deficits in a variety of language comprehension tasks (Nicholas, Connor, Obler, & Albert, 1998), including reading comprehension (Daneman & Carpenter, 1980), the understanding of syntactically complex sentences (Davis & Ball, 1989), identification of pronoun references in sentences (Light, 1988), and inferencing (Cohen, 1979). Researchers argue that WM is central to language comprehension because it

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is necessary for integration of information and resolution of ambiguity (Daneman & Carpenter, 1980; Salthouse, 1990). At present, little is known about the relationship between WM and figurative language comprehension.

Age, Working Memory, and Figurative Language Comprehension

Figurative language enlivens and enriches meaning and is used to convey thoughts, feelings, and ideas that may be inexpressible or less effectively expressed (Bischofshausen, Makoid, & Cole, 1989) using literal language. Employing the overlapping processes of cognition, language, pragmatics, and world knowledge, figurative language competence is an indication of higher abstract thinking (Levorato & Cacciari, 1992) and, therefore, demonstrates higher level language processing. Idioms (e.g., *skate on thin ice*), metaphors (e.g., *crime is disease*), and metonyms (e.g., *Wall Street is in a panic*) are three figurative language types (FLT) that constitute a substantial proportion of everyday language (Gibbs, 1995; Makai, Boatner, & Gates, 1995; Milosky, 1994). Consequently, appropriate understanding and use of these sayings is integral for effective communication.

For older adults who show age-related decline in cognitive skills such as WM (Salthouse, 1994) and in higher level language processing such as difficulty inferring meaning or integrating context (Cohen, 1979), comprehension of the connotative meanings of figurative sayings may present a considerable challenge. Furthermore, although they have been less studied, the type of saying (Qualls, Obler, Connor, & Albert, 2001) and reading ability (e.g., Nippold, Maron, & Schwartz, 2001) can influence comprehension of figurative language. Investigation of figurative language comprehension in older adults can provide much needed insight regarding the relationship between and among these variables and is, therefore, both theoretically and practically essential.

Normative studies using college-age adults have contributed significantly to our understanding of the theoretical, neurocognitive, and linguistic bases of figurative language processing in adults (Bischofshausen et al., 1989; Bottini et al., 1994; Burgess & Chiarello, 1996; Camac & Glucksberg, 1984; Clark & Gerrig, 1983; Gibbs & Gerrig, 1989; Gibbs & Nayak, 1989; McGlone, Glucksberg, & Cacciari, 1994; Pynte, Besson, Robichon, & Poli, 1996; Roberts & Kreuz, 1994; Verbrugge & McCarrell, 1977). To date, few investigations have focused exclusively on comprehension of figurative language in neurologically intact older adults (Boswell, 1982; Gregory & Waggoner, 1996; Kramer & Woodruff, 1984; Qualls, Obler, et al., 2001; Szuchman & Erber, 1990; Tompkins, Boada, & McGarry, 1992; Vogel, Sugar, & Cardillo, 1995; Zelinski & Hyde, 1996). Findings across studies are largely mixed, primarily because of the methods used as well as the type of figure of speech studied (see Gregory & Waggoner, 1996). Nevertheless, age differences have been reported (Qualls, Obler, et al., 2001; Vogel et al., 1995; Zelinski & Hyde, 1996), suggesting that, for some older adults, comprehension of figures of speech will be difficult. Findings also show that WM is related to figurative language comprehension (Qualls, Bodle, et al., 2001), and that WM decline in older adults may account for their decreased ability to explain figures of speech (Vogel et al., 1995), although some researchers claim that semantic memory deficits, not WM decline, explain older adults' difficulty with figurative language (Zelinski & Hyde, 1996). Research has also shown that the particular task (e.g., verbal explanation versus forced choice) used to test figurative language knowledge will determine whether or not age differences will be observed (Gregory & Waggoner, 1996).

The extant literature on figurative language processing in aging reveals that our current knowledge of how older adults process figurative language continues to be grossly lacking. For example, the majority of the studies showing age effects employed a production paradigm. However, production tasks are fraught with problems, particularly because of the inability to control for factors unrelated to figurative language that may affect older adults' verbal abilities. Word retrieval failures and other memory difficulties, as well as inaccurate interpretation of participant responses, are just a few of the challenges encountered in production studies with older adults. Nevertheless, this research has provided useful insights regarding older adults' comprehension of figurative language.

Using a metalinguistic (active retrieval and analysis of information stored in memory) task, Vogel et al. (1995) investigated older adults' ability to explain idioms. They concluded that the older adults' decreased ability to explain idioms compared to the younger adults was a function of age-related WM decline. Upon examination of the verbal interpretations of idioms and proverbs by normal adults in four age groups (30s, 50s, 60s, and 70s+), Qualls, Obler, et al. (2001) found that, as people age, they have greater difficulty explaining the meanings of proverbs and idioms. These researchers also found low, but significant, correlations between the adults' ability to interpret proverbs and their WM performance—and cautioned that additional data are needed before claims can be made. Zelinski and Hyde (1996) found age-related performance differences on their verbal production task for sense creation (metonymic processing). They attributed the age-related deficits to semantic memory difficulties: the older adults' tendency to generalize when integrating contextual information resulted in errors in interpretation.

The age effects found in these studies may have been more pronounced because of the memory load imposed by the task. It may be that, for verbal production tasks, the target query (e.g., auditorily presented short story, followed by the question: "What does it mean to 'skate on thin ice'?") is retained in memory while the processing component is involved in assembling, formulating, and producing the appropriate response. Older adults may be disadvantaged in such a task, possibly due to reduced WM capacity (Zacks & Hasher, 1988) or inefficiency in allocating available resources (Foos, 1995). Therefore, it is possible that a purely comprehension task (i.e., forced choice) will reduce the memory load associated with

production tasks and provide a better indication of older adults' figurative language comprehension ability.

Gregory and Waggoner (1996) tested comprehension and production of figurative language in both younger and older adults. On their 12-item forced-choice comprehension task, no significant age differences (92.4% accuracy for younger adults; 90.3% for older adults) emerged. However, on their explanation task, these researchers found qualitative differences in the type of responses provided by the groups: The younger adults produced more complete, metaphorical responses, and the older adults produced more story-fabrication responses. Zelinski and Hyde (1996) reported a similar finding of no age differences on their metonym verification task. Thus, task requirements (verbal explanation, verification, forced-choice) will influence how WM resources will be parsed during the comprehension process so that, when memory load is low, older adults perform as well as younger adults (Gregory & Waggoner, 1996; Zelinski & Hyde, 1996). Foos and Wright (1992) argue that when storage requirements are minimized, older adults perform similarly to younger adults. Still, some older adults are less accurate than younger adults in fact recognition and inference accuracy (Light, Zelinski, & Moore, 1982). Therefore, it possible that, when figures of speech are presented free of context during a forced-choice task, age differences will be observed. It is also possible that adults will comprehend different classes of figures (e.g., idiom, proverb, metonym) with varying degrees of accuracy even when memory load is minimal.

Figurative Language Type

The relationship between the literal and figurative targets (e.g., in the metaphor, "Time is money," where *time* is the topic and *money* is the vehicle) will determine how and what cognitive resources (i.e., WM) will be allocated during comprehension. This notion is particularly salient for distinguishing the cognitive processing requirements for comprehending different FLTs. For example, given that both metaphor and metonymic comprehension require inferential processing (e.g., Clark & Gerrig, 1983; Gregory & Wagonner, 1996; Zacks & Hasher, 1988), working memory decline may account for some of the age-related variance. Idioms may not require utilization of WM processes to the same extent, probably because idioms are stored in memory as whole words in a process called lexicalization (e.g., Swinney & Cutler, 1979), and, familiarity may be more important for comprehension. In their study, Qualls, Obler, et al. (2001) demonstrated differential performance on idioms and proverbs; across groups, the proverbs were more difficult to interpret. Another consideration relates to the function of figurative language. Because different figures of speech serve different communicative goals (e.g., metaphors clarify, whereas idiomatic expressions add interest) (Roberts & Kreuz, 1994), particular figures of speech will differ in their linguistic structure. Thus, it is reasonable to assume that cognitive processing resource requirements will differ, depending on the FLT.

Reading Ability and Figurative Language Comprehension

Reading ability is associated with figurative language competence, as largely reported in the child language literature (Nippold et al., 2001; Qualls, Bodle et al., 2001; Reynolds, Qualls, & Harris, 1998). The assumption is that good reading ability enhances lexical development, which, in turn, increases knowledge of figures of speech. To date, the relationship between reading ability and figurative language comprehension in adults has not been clearly established.

Purpose

Past research on figurative language in aging has focused on the effects of individual variables (e.g., memory, task requirements) on comprehension while overlooking the collective effect of several factors. However, there is evidence showing that several variables, including age, WM, FLT, and reading comprehension (RC) will influence adults' performance on tests of figurative language. To date, no single study has investigated the cognitive and linguistic processes associated with comprehension of various FLTs in adults, and no research has examined adult comprehension of figurative language in relation to reading ability. This study investigated the relationships between and among those variables deemed to be relevant to adults' comprehension of figurative language. There were three major goals for this research: (1) to assess age-related differences in figurative language comprehension, with specific focus on the relationship between WM and comprehension, (2) to assess differences in comprehension across three FLTs, including idioms, metaphors, and metonyms, and (3) to assess the relationship between RC and figurative language comprehension.

Method

Participants

Forty younger (9 men, 31 women; ages 17–31 years) and 40 older (5 men, 35 women, ages 54–73 years) African American adults provided data for this study (see Table 1). At the time of testing, all participants were residents of an urban city in the South. Each individual provided written consent and was paid for his or her participation. The younger adults were recruited from area apartment complexes, churches, and a local university. The older adults were recruited from churches, senior citizens buildings, and from referrals made by other research participants. Mean education level was 14.30 years for the younger adults and 13.50 years for the older adults, with no significant difference ($p = .199$) between the groups. Participant selection criteria included a negative history of neurologic and psychiatric diagnoses, a negative history of language or learning disability, and the ability to read 12-point type. The participants rated their health status on a 5-point scale (1 = excellent, 5 = poor); their neurologic status and use of neuroleptic drugs was determined by self-report on a health questionnaire.

TABLE 1. Participant characteristics and ability measures.

	Younger Adults (n = 40)		Older Adults (n = 40)		
	M	*SD*	*M*	*SD*	*t*
Age	22.30	4.22	63.25	5.48	—
Health[a]	1.53	.64	2.33	.89	–4.62**
Education[b]	14.30	2.30	13.50	3.15	1.30
Mini-Mental State Exam	—	—	28.15	1.53	—
Size Judgment Span Test	2.98	.48	2.43	.55	4.77**
Alphabet Span Test (AS)	33.63	12.44	17.65	7.96	6.84**
Nelson-Denny RC Test					
Vocabulary	55.00	15.37	51.45	17.17	.97
RC	28.60	7.76	16.43	8.87	6.54**

[a] scale is 1 (excellent) to 5 (poor).
[b] formal years of schooling.
Note. Two-tail significance at 95% confidence interval
** $p < .001$

To participate, the older adults were required to a score 25 or above on the Mini-Mental State Exam (MMSE) (Folstein, Folstein, & McHugh, 1975). The MMSE is sensitive to detecting early dementia (Folstein et al., 1975), and is typically used to screen for alterations in mental abilities in the older adults. Three individuals were excluded from participation in the present study as a result of their depressed scores (less than 25 out of a possible 30 points) on this test. The mean MMSE score was 28.15 (*SD* = 1.53; range = 25—30) for the older adults who participated, a finding that is consistent with the age-specific norms identified by Bleecker, Bolla-Wilson, Kawas, & Agnew (1988). All individuals demonstrated adequate hearing during informal conversation and during administration of the MMSE.

Materials

Participants completed two WM tasks, a reading ability test, and the experimental Figurative Language Comprehension Test. Results of the WM and reading ability tests are summarized in Table 1. All tests were pen-and-paper, and, with the exception of the reading comprehension subtest of the Nelson-Denny Reading Test (Brown, Fishco, & Hanna, 1993), were untimed.

Ability tests. The Size Judgment Span Test (Cherry & Park, 1993) requires the individual to listen to a single-presentation list of the names of objects and animals and to repeat them in order of size from smallest to largest. There are a total of seven levels consisting of three trials each, progressing from two to eight words at each level (Level 1: 2 words to Level 7: 8 words). A raw score is derived by adding the total number of levels at which at least 2 out of 3 trials are correct. The Alphabet Span Test (Craik, 1986) requires the individual to listen to single-presentation lists of words, alphabetize the words mentally, and then write the words in alphabetical order. Each level consists of three trials and progresses from two to nine words per level (Level 1: 2 words to Level 8: 9 words). The absolute span score is the sum total of all correct responses at each level where at least two trials out of three are correct. The Nelson-Denny Reading Test (Brown et al., 1993), including vocabulary and reading comprehension subtests, was used as a measure of reading ability. The vocabulary subtest consists of 80 multiple-choice items and the reading comprehension subtest consists of eight expository passages with a variable number of multiple-choice items following each passage. All participants were given 30 minutes to complete the reading comprehension subtest.

Experimental task. The Figurative Language Comprehension Test (FLCT), constructed by the first author for this experiment, consisted of 60 figures of speech (see Appendix A), including 20 idioms, 20 metaphors, and 20 metonyms as well as their corresponding response choices (see Appendix B for examples of the experimental stimuli). To ensure validity of the experimental task, the figures of speech used in this study were taken from published research and standard books of idioms (Gibbs, 1995; Makkai et al., 1995; Nippold & Rudzinski, 1993; Nippold & Taylor, 1995; Smitherman, 1994; Swinney & Cutler, 1979; Verbrugge & McCarrell, 1977). An 11-page test booklet contained instructions on the first page, followed on subsequent pages by six figures of speech per page and their corresponding response-choices. The figures of speech were presented independent of context, and four response choices were provided for each of the 60 items, only one of which constituted the target response.

To disambiguate the target from the foils, the following scheme was employed to construct response choices that were equally distributed across the four options. A correct figurative interpretation (CFI) constitutes the target response. A correct literal interpretation (CLI) conveys the actual meaning but is incorrect relative to the target. An incorrect opposite foil (IOF) is semantically opposite and incorrect relative to the target. An incorrect elaborated foil (IEF) is implausible relative to the target. Internal consistency reliability data were obtained on the experimental instrument based on the described response-construction scheme. Only those items that met the criterion of .70 or higher were retained for use in the experimental task (see *Reliability* section below).

Before the study, the Figurative Language Familiarity Rating Scale (FLFRS), constructed by the first author for this study, was administered to obtain an estimate of familiarity. All participants were asked to rate (on a 3-point rating scale) how frequently (3 = many times, 2 = several times, or 1 = rarely) they had read or heard each figure of speech. The figures of speech were presented in alphabetical order and all participants received the same order of presentation. The FLFRS included 60 figures of speech identical to those used in the experimental task.

Administration. All participants received identical test booklets and instructions. To control for possible order

effects, the figures of speech were ordered as follows: *idiom-metaphor-metonym*, *metaphor-metonym-idiom*, *metonym-idiom-metaphor*, and so forth. All participants received the same order of presentation. Definitions and examples of each FLT were provided. To assess each participant's understanding, the examiner presented examples, posed questions, provided corrective feedback, and ascertained whether each individual understood the instructions. Participants then were instructed to silently read each figure of speech and choose the response choice that yielded a figurative, or nonliteral, interpretation.

The testing protocol was somewhat lengthy. Therefore, to control for fatigue, and because response time was not a factor, short and frequent breaks were given as needed. The majority of the participants completed the tasks within 2 to 2.5 hours, with only 3 of the older adults requiring additional time. A second session was scheduled to accommodate these individuals.

Reliability

Figurative Language Comprehension Test. Before the experiment began, a reliability study was conducted to determine whether the items on the Figurative Language Comprehension Test (FLCT) would demonstrate internal consistency, based on a .70 reliability criterion. Ten healthy African American adults (2 men, 8 women) with a mean age of 45years, 4 months (range = 17–73 years) and mean education level of 13.2 years (range = 8–20 years) provided data for the study. All participants reported a negative history of neurological damage and language learning disability.

Eighty-six figures of speech were used—35 idioms, 25 metaphors, and 26 metonyms and their corresponding response choices ($N = 4$). The response choices were constructed using the response-choice scheme described previously (see *Experimental task*). Before the task was performed, definitions and examples of the figures of speech were provided, as well as corrective feedback. Participants were instructed to read each figurative saying and choose the response choice that indicated a nonliteral interpretation. The figures of speech were administered in the following order: idioms, metaphors, and metonyms.

The Kuder-Richardson 20 coefficient (Cronbach's alpha was used as an estimate of internal consistency for the figures of speech used in the reliability study. A series of combinations of items was explored to achieve the greatest reliability among the items. An α of .90 was obtained for 60 of the 86 items. Three subscales, including 20 idioms, 20 metaphors, and 20 metonyms, were also analyzed. Of the three figurative language subscales, metaphors yielded the highest reliability ($\alpha = .85$), followed by the metonyms ($\alpha = .78$), and the idioms ($\alpha = .76$). All of the subscales were significantly correlated ($p < .0001$), indicating a linear relationship between the idioms, metaphors, and metonyms. It was concluded that this combination of items was sufficiently homogeneous and that they measured the same construct. Therefore, these 60 figures of speech and their corresponding response choices constituted the experimental instrument (FLCT).

Procedures

Scoring for the experimental task. All of the experimental data were scored, checked, input into a computer database, and verified by the first author and a second individual trained by the first author. Additionally, two graduate students in communication disorders, also trained by the first author, served as judges in categorizing the response choices on the FLCT. The judges independently assigned each of the 60 responses for all 80 participants to one of the four designated response categories (CFI, CLI, IOF, and IEF). Of the 4,800 responses (80 participants × 60 responses each), there was 100% agreement on 4,778 responses, yielding 99.5% interjudge reliability. Agreement was reached by consensus between the judges and the first author on the remaining 22 responses (0.5%). The target response category (CFI) was not affected by the 22 responses on which the two judges originally disagreed.

Research design, data preparation, and analyses. A 2 × 3 mixed factorial quasi-experimental design was used: Age Group (younger and older adults) was the between-subjects factor, and FLT (idioms, metaphors, and metonyms) was manipulated within subjects. To eliminate the possibility of guessing on the experimental task, items rated as 1.5 and below (on a 3-point scale of the Figurative Language Familiarity Rating Scale) were deemed to be low familiar items ($N = 12$) and were deleted from all analyses. Analyses were then conducted using the remaining 48 figures of speech. Individual scores from each of the three FLTs (idioms, metaphors, and metonyms) and composite scores (mean of the three FLTs), representing a measure of overall figurative language comprehension, were included in the analyses. Correlations were conducted to determine the relationships between variables, including figurative language comprehension, WM, and RC. Variables that correlated significantly with figurative language comprehension were included as covariates. Descriptive analyses, along with a repeated measures analysis of covariance (ANCOVA), were conducted to determine the main effects of age and FLT on comprehension, as well as interaction effects of age by FLT. Significant F's were followed by Tukey's post hoc tests, which investigated differences between the means.

Results

Ability Tests

Table 1 shows ability test data for the two groups. To control for the probability of a Type I error as a result of conducting multiple independent samples t tests, an adjusted alpha level of .01 was used. Results indicated that the younger adults performed significantly better than the older adults on the WM measures [size judgment span, $t(78) = 4.77$, $p = .00$; alphabet span, $t(78) = 6.84$, $p = .00$] and RC, $t(78) = 6.54$, $p = .00$. No significant differences were found between the groups for vocabulary, $t(78) = 0.97$, $p = .33$.

Correlational Analyses

Working memory. The combined groups of younger and older adults showed low-to-moderate Pearson

product-moment correlations that were significant between performance on size judgment span and figurative language comprehension ($r = .40$, $p = .00$), and alphabet span and figurative language comprehension ($r = .54$, $p = .00$). Individual group examination (see Table 2) of the relationship between size judgment span and comprehension revealed a nonsignificant correlation for the younger adults ($r = .22$, $p = .18$) and a low but significant correlation for the older adults ($r = .39$, $p = .01$). For alphabet span, the younger ($r = .43$; $p = .01$) and older ($r = .63$; $p = .00$) adults showed moderate-to-strong correlations that were significant between WM and comprehension. Across FLTs, significant correlations were found between alphabet span and figurative language comprehension for the younger adults (idioms, $r = .33$, $p = 04$; metaphors, $r = .37$, $p = 02$, and metonyms, $r = .47$, $p = 00$) and the older adults (idioms, $r = .58$, $p = 00$; metaphors, $r = .58$, $p = 00$; and metonyms, $r = .51$, $p = 00$).

Reading comprehension. For the combined groups of younger and older adults, RC showed a significantly greater association with figurative language comprehension ($r = .72$, $p = .00$) than did WM performance. Individual group data (see Table 2) showed significant correlations between RC and total score on the FLCT for the younger ($r = .87$, $p = .00$) and older ($r = .60$, $p = .00$) adults. For the younger adults, results by FLT revealed significant correlations between RC and idioms ($r = .81$, $p = .00$), metaphors ($r = .80$, $p = .00$), and metonyms ($r = .60$, $p = .00$). Likewise, the older adults showed significant correlations between RC and idioms ($r = .53$, p = .00), metaphors (r = .48, p = .00), and metonyms (r = .56, p = .00).

Effects of Age and Figurative Language Type

Mean performance accuracy on the FLCT for all of the adults ($N = 80$) was 68%, with younger adults obtaining 72% and older adults obtaining 63% overall mean accuracy. Table 3 contains the mean accuracy data (including standard deviations and ranges) for the groups on the figurative language comprehension task. To investigate the linear relationships with figurative language comprehension (the dependent variable), both alphabet span (WM measure) and RC were covaried with age (the independent variable) on a repeated measures analysis of variance (ANCOVA).

Before analysis, the assumptions underlying ANCOVA were tested, including the existence of a linear relationship between the covariates and the dependent variable and homogeneity of regression (Hinkle, Wiersma, & Jurs, 1994). This first assumption was met, evidenced by the previously discussed correlations. The second assumption has to do with the regression line within the groups, which showed the same slope across groups and was also met.

Results of the ANCOVA revealed a significant interaction between age and FLT, $F(2, 152) = 8.721$, $p = .00$. Therefore, the results will be discussed in light of the interaction effects. Tukey's post hoc analyses comparing the marginal means revealed that, with WM and RC controlled, the older adults outperformed the younger adults on idioms, $t(39) = 15.714$, $p = .00$, and metonyms, $t(39) = 7.143$, $p = .00$. Performance on the metaphors was comparable between the groups $t(39) = 0.714$). The age difference was most pronounced on the idioms $M = 0.66$ for younger adult and 0.88 for older adults), which were comprehended with the greatest accuracy across types by the older adults. For the younger adults, the metaphors $M =$ 0.68 were slightly more accurate than the idioms M = 0.66). For both groups, of the three types, the metonyms were comprehended with the least accuracy.

TABLE 2. Pearson correlations (*r*) showing relationships between working memory performance, reading comprehension, and figurative language comprehension.

Group	Size judgment span	Alphabet span	Reading comprehension
Younger Adults ($n = 40$)			
Idioms	.24	.33*	.81**
Metaphors	.11	.37*	.80**
Metonyms	.20	.47**	.60**
Total FLCT score	.22	.43**	.87**
Older Adults ($n = 40$)			
Idioms	.35*	.58**	.53**
Metaphors	.42*	.58**	.48**
Metonyms	.27	.51**	.56**
Total FLCT score	.39*	.63**	.60**

Note. Two-tail significance at 95% confidence level.
*$p < .05$, **$p < .01$.

Discussion

The collective effects of age, WM, FLT, and RC determined comprehension patterns in the younger and older African American participants in this study. Specifically, the older adults showed attenuated memory and reading abilities that depressed their performance on the FLCT. With WM and RC controlled, the older adults' performance was superior to the younger adults' on idioms and metonyms, but not on metaphors. These findings demonstrate that WM and RC are significant influencing

TABLE 3. Raw mean percentages (estimated marginal means in parentheses), standard deviations, and ranges by group and figurative language type.

Figurative language type	Younger adults ($n = 40$)	Older adults ($n = 40$)	Combined groups ($N = 80$)
Idioms ($n = 17$)			
M	.78 (.66)	.75 (.88)	.77
SD	.24	.22	.23
Range	.14–1.00	.14–1.00	.14–1.00
Metaphors ($n = 15$)			
M	.76 (.68)	.60 (.69)	.68
SD	.16	.16	.18
Range	.42–1.00	.25–.83	.25–1.00
Metonyms ($n = 16$)			
M	.63 (.54)	.55 (.64)	.59
SD	.12	.20	.17
Range	.36–.91	.18–.91	.18–.91

factors in adult comprehension of figurative language. The present findings also provide evidence for our hypothesis that different cognitive processing resources support comprehension of different classes of figures of speech, although age mediated performance differences as a function of FLT.

The first goal of the present study was to assess age-related differences in figurative language comprehension, with specific focus on the relationship between WM and comprehension. The WM findings will be discussed first, followed by age effects. The older adults in the present study showed more difficulty completing the WM tasks than the younger adults, a finding likely due to capacity limitations or inefficient allocation of resources (Craik, 1986; Foos, 1989, 1995; Foos & Wright, 1992; Just & Carpenter, 1992; Salthouse, 1994). Age differences emerged on both WM tasks, although the most dramatic performance differences between the younger and older adults were observed on the alphabet span test, suggesting that this task may be more sensitive to age effects. Our findings support the literature showing age-related deficits on tasks presumed to tax WM (e.g., Craik, 1986; Daneman & Carpenter, 1980; Foos, 1989; Harris et al., 1998).

The association between WM performance and figurative language comprehension was observed in both the younger and the older adults. These results suggest the overlapping processes between WM and figurative language competence. For instance, one aspect of figurative language competence assumes the ability to use contextual information to construct meaning (Levorato & Cacciari, 1992). Thus, integration and inferencing is necessary for comprehension— and both of these skills are mediated by WM (Daneman & Carpenter, 1980; Salthouse, 1990). Another aspect of figurative language competence deals with the ability to defer a literal interpretation (Levorato & Cacciari, 1992). Searle's (1995) three-stage model of metaphor comprehension illustrates how WM is involved in resolution of ambiguity (Daneman & Carpenter, 1980; Salthouse, 1990) to allow for nonliteral comprehension. The 3-stage model proposes that one must first determine the literal meaning of the utterance, check that meaning against the context, and then, if there is a conflict between the literal meaning and the context, reinterpret the literal meaning to derive a conveyed meaning (Searle, 1995).

In the present study, when WM was accounted for, the direction of the age effects for idioms and metonyms was reversed. When the groups were equated on WM abilities, the older adults demonstrated better comprehension than their younger counterparts. These findings are contrary to the studies showing age-related decline in figurative language based on verbal interpretations (Qualls, Obler, et al., 2001; Vogel et al., 1995; Zelinski & Hyde, 1996). Study results do, however, concur with the research showing no age-related decline in figurative language competence on forced-choice and verification tasks (Gregory & Waggoner, 1996; Zelinski & Hyde, 1996). The present findings also augment studies that found a relationship between WM and figurative language comprehension (Qualls, Obler, et al., 2001; Vogel et al., 1995). These results, therefore, demonstrate the robustness of the relationships between age, WM, and figurative language comprehension.

Several alternative explanations are explored. First, WM, along with RC, was statistically controlled in this study, resulting in the possibility that other, unknown sample factors may have confounded the results. However, random error was controlled as a result of taking appropriate preparatory steps with the data before analysis (see *Results* section). Second, cohort effects may have confounded our results. With the low familiarity items deleted, it is possible that the older adults in this sample were more familiar with the remaining figures of speech than were the younger adults. The deleted items may have also reduced the younger adults' opportunities for guessing. This is likely not the case, as the deleted items were collapsed ratings obtained from both groups of younger and older adults, suggesting ratings were similar across groups. Still, for this set of figures of speech, world knowledge and enriched vocabulary (Harris et al., 1998; Ortony, Turner, & Larson-Shapiro, 1985) could have provided an advantage to the older adults in this study. These findings provide adult data supporting the notion that familiarity with specific figures of speech may influence performance on figurative language tests (Nippold & Rudzinski, 1993; Nippold & Taylor, 1995; Qualls & Harris, 1999). Third, task requirements could have affected the outcome of this study. This research employed a forced-choice task, whereas the majority of the research on figurative language and aging has employed verbal production tasks. Literature on aging shows that, in the absence of time constraints, age differences on many cognitive tasks are minimized or eliminated (Salthouse, 1994) and that older adults do as well as younger adults on verification or recognition tasks (Harris et al., 1998; Zelinski & Hyde, 1996). Our findings support prior research showing no age-related decline in figurative language competence when assessed by tasks that provide a selection of response choices (Gregory & Waggoner, 1996; Zelinski & Hyde, 1996), and they provide further evidence that task requirements will differentiate competence and performance (Light, 1988).

The second goal of this study was to assess differences in comprehension between idioms, metaphors, and metonyms. This study represents a first look at comprehension as a function of FLT. The premise was that the three types would be comprehended differentially and that idioms would yield the greatest accuracy for both groups of adults. The adults in this study comprehended the idioms, metaphors, and metonyms with varying degrees of accuracy, thus supporting our hypothesis that the FLTs require different cognitive-linguistic abilities (e.g., memory, the nature of the figure, and familiarity) for accurate nonliteral interpretation. The results of this study also showed that age mediated performance differences across the FLTs.

For the older adults, idioms were significantly more accurate than the metaphors and metonyms, providing evidence for preserved lexical and semantic abilities in this population (Qualls, Obler, et al., 2001). These findings also provide indirect evidence for the lexical representation hypothesis (Swinney & Cutler, 1979), which posits that idioms are stored in the mental lexicon in the same way as words are. We speculate that the older adults' high scores

on the idioms reflect minimal cognitive effort for making response-choice decisions about the figurative connotation of the sayings. Tompkins, Bloise, Timko, & Baumgaertner's (1994) normally aging older adults demonstrated high accuracy on low-resource-demanding tasks. To comprehend metaphors, one must be able to make inferences about the ground (implicit comparison) of a metaphor—inferences that would not be necessary in the comprehension of literal statements (Ortony, Schallert, Reynolds, & Antos, 1978). Given the evidence that older adults have difficulty in the inferential stage of comprehension (Cohen, 1979; Zacks & Hasher, 1988), the older adults should have demonstrated more difficulty than the younger adults in comprehending metaphors. Study results disconfirm this notion, showing comparable performance by the younger and older adults on the metaphors. A possible interpretation is that, because metaphors are novel expressions, understanding these figures of speech will be constrained by the level of contextual support provided (Ortony et al., 1985) regardless of age. In the present study, the figures of speech were presented free of context, thus imposing greater demands on one's ability to make inferences about the figurative meaning of the utterance. These findings support the conclusion that, when zero context metaphors are presented, no consistent interpretation will emerge (Fraser, 1995). Metonymic comprehension requires increased memory load and inferential processing, including retrieval of relevant information from long-term memory, use of available context, and matching of contextual information to relevant information by determining the similarities between the metonymic targets (Clark & Gerrig, 1983). The adults in this study showed their greatest difficulty on metonyms, rather than on idioms and metaphors. It is possible that, although metonyms occur frequently in the language, comprehension may depend largely on the linguistic and social contexts in which they occur. The assumption, in this view, is that common-ground information or shared knowledge is important for comprehension (e.g., Clark & Gerrig, 1983). Therefore, one might speculate that metonymy is more frequently used by individuals in select subcultures—for example, musicians, physicians or businesspeople. The adults in this study may have had little or no experience using metonymy. Furthermore, the particular metonyms used in this study may have been a disadvantage for the adults. Thus, as with metaphors, comprehension will be compromised in the absence of adequate context.

The third goal of this study was to assess the relationship between RC and figurative language comprehension. Study results showed robust correlations between RC and total performance on the FLCT for both groups, although the strength of the association was greater for the younger adults. These results support findings in the developmental literature showing the relationship between reading and writing skills and idiom comprehension (Nippold et al., 2001; Qualls, Bodle et al., 2001; Qualls, O'Brien et al., 2001; Reynolds et al., 1998). The findings in the present study not only support literature showing an association between reading ability and idiom knowledge but also provide evidence that reading ability is related to metaphoric and metonymic knowledge as well. Before this study, a direct link between reading ability and figurative language comprehension in adults had not been established. Considering the strong reading and vocabulary skills of the adults in the present study, it is not surprising that RC and figurative language comprehension were related. Idiom knowledge develops from lexical knowledge, which is acquired largely through reading (e.g., Nippold et al., 2001; Swinney & Cutler, 1979). In the present study, RC was not only related to figurative language, but along with WM, it influenced significantly the younger and older adults' performance on the FLCT. Reading comprehension ability, therefore, emerged as a predictor of performance on tests assessing figurative language competence in adults.

Conclusions and Implications

Figurative language constitutes a substantial portion of all language, and its understanding is essential to everyday communicative interactions. This research offers new knowledge about the appreciable influences of age, WM, FLT, and RC on adults' comprehension of figurative language. Results showed that, for the older African American adults in this study, comprehension of figurative language is largely preserved. Consequently, when WM and RC difficulties are present, older adults may show a decline in their figurative language abilities. Therefore, WM and RC ability should be taken into consideration when interpreting performance on tests assessing figurative language competence, particularly for older adults. Although this study yielded robust findings, systematic replications of this research with other population subgroups will inform us whether these findings can be generalized across all subgoups. The results of this study also provide preliminary data regarding the cognitive and linguistic requirements associated with comprehension of different FLTs. Future research is warranted to confirm and extend these findings, however. Continued investigations of figurative language comprehension in aging will, importantly; (a) provide greater insight regarding the nonlinguistic (e.g., WM, familiarity) and linguistic (e.g., FLT, reading ability) variables associated with figurative language competence for older adults and (b) help researchers formulate a basis for understanding figurative language in individuals with brain damage.

Our preliminary impressions regarding adult development of figurative language comprehension must be cautiously interpreted. First, nonliteral language comprehension performance in a controlled experimental environment differs in important ways from performance in a naturalistic environment where contextual cues are more abundant. Second, our study employed a cross-sectional research design to investigate performance differences between younger and older adults, which limits any generalization to the individuals in these discrete age groups. Third, the figures of speech chosen for this study may not accurately reflect the participants' figurative language competence, particularly because figurative language is culturally based. Future research using alternate paradigms (e.g., longitudinal and verbal production studies), FLTs (e.g., proverbs, irony), contexts (e.g., in

sentences, paragraph-length material, conversation), tasks (e.g., auditorily presented, written, computer based), and populations (e.g., other cultural groups, disorder populations such as aphasia and dementia) is warranted to validate our initial impressions of age considerations in figurative language competence.

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Appendix A

The Sixty Figures of Speech on the Figurative Language Comprehension Test (FLCT)

Idioms	Metaphors	Metonyms
1. pay dues	1. crime is disease	1. the Man
2. go around in circles	2. cigarettes are time bombs	2. Wall Street is in a panic
3. put one's foot down	3. she is a sunny person	3. the pen is mightier than the sword
4. breathe down someone's neck	4. time is money	4. the Club
5. read between the lines	5. she's a doll	5. Hollywood is putting out trash movies
6. put their heads together	6. your mouth ain't the Bible	6. Paris has dropped the hemlines
7. skate on thin ice	7. billboards are warts on the landscape	7. who's the man
8. beat around the bush	8. news people are piranhas	8. they prefer the bullet to the ballot box
9. keep up one's end	9. life is a journey	9. he's on the throne
10. cross swords with someone	10. the boxer is a creampuff	10. we need more hands
11. blow the cobwebs away	11. he is scum	11. the buses are on strike
12. paper over the cracks	12. argument is war	12. she porched the newspaper
13. hoe one's own row	13. she's a pig	13. Richard Nixon is the submarine of politicians
14. go jump in the lake	14. my job is a jail	14. he's reading the Good Book
15. cut the rug	15. electricity is flowing water	15. the wild blue yonder
16. be in the family way	16. he is an angel	16. the hawk
17. open the doors of the church	17. knowledge is power	17. the scalpel was sued for malpractice
18. calling hogs	18. some men are dogs	18. gospel bird
19. run into the ground	19. this paper is garbage	19. the tuxedo was fired because he kept dropping the tray
20. he's wearing a rug	20. he's a bomb	20. that'll be fifteen dead Presidents

Appendix B

Examples of Test Items on the Figurative Language Comprehension Test (FLCT)

Idioms	Metaphors	Metonyms
Keep up one's end	**Crime is disease**	**That'll be fifteen dead presidents**
A. to do your share of the work*	A. crime pays big dividends+++	A. that'll be fifteen deceased chief executive officers+
B. to wait for others to do something++	B. crime is not a serious problem++	B. that'll be fifteen poker chips++
C. to carry a weight around+++	C. crime is a serious health problem*	C. that'll be fifteen dollars*
D. to prop up the right side+	D. crime is contagious+	D. that'll be fifteen White house staffers+++
Cross swords with someone	**Cigarettes are time bombs**	**The pen is mightier than the sword**
A. to make peace++	A. cigarettes explode+	A. a writing instrument is sharper than a knife+
B. to be a hero+++	B. cigarettes satisfy hunger pangs+++	B. the spoken word is not as sharp as the written word++
C. to fence with a partner+	C. cigarettes are healthy++	C. the written word can cut deeper than any blade*
D. to argue or fight*	D. cigarettes slowly kill*	D. a writing instrument is a good gift idea+++

Note. *target response; +correct literal interpretation; ++incorrect opposite foil; +++incorrect elaborate foil.